

# Exploring the Integration of Generative AI in Modern Writing Pedagogy: Trends and Implications for Education

## 현대 글쓰기 교육에서 생성형 인공지능의 통합 탐구: 교육에의 함의와 동향

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### ABSTRACT

This annotated bibliographical study investigates current research on writing pedagogy and advancements and responses to the introduction of large language model artificial intelligence. After screening articles collated from various academic databases, research was synthesized into themes revolving around writing instruction, teacher and institutional reactions to digital writing, and early ideas about including Artificial Intelligence during the writing process in a manner that honors academic integrity. This literature review supports the notion that writing pedagogy must continue to innovate as our working definitions of literacies grow to include competencies decoding media beyond print alone. Teachers and academic institutions need support, training, and guidelines on how to leverage digital communication to best prepare students to navigate contemporary society and thrive. Furthermore, students need to be explicitly taught how to engage with generative AI models like ChatGPT to ensure that they remain critical creators and consumers of media.

**Keywords:** Computer Education, Industry-Academia Collaboration, Education focusing on Industry-Demands, Field-Oriented Software Education

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### 1. Introduction

Traditionally defined literacy focuses on the communication mediums of reading, writing, speaking, and listening. Communication styles are changing from purely text-based to now including so many different visual and mixed media. As such, the nature of literacy and writing instruction needs to continue evolving to include these new forms of communication. Today's literacy classrooms need to embrace the concept of multiple literacies, which are social practices that transcend individual modes of communication[1].

These new spaces for communication create new motivations for emerging writers. Multigenre writing helps build choice, which fosters agency in writing

students[2]. Audience awareness as well as access to authentic audiences helps drive a writer's choices and helps create purposeful decision-making[3, 4, 5]. Authentic audiences help motivate young writers[6]. Eyes beyond the teacher serve as a strong motivation to craft an early writer's voice. Digital spaces open audiences from merely the teacher to parents, peers, and community members. These spaces can be leveraged to augment student learning by creating collaborative learning spaces that are authentic learning environments[7].

While we are witnessing rapidly advancing technology, the human brain has not moved away from needing both guided practice and direct instruction. Literacy instruction must still balance embracing new technologies while retaining proven educational

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practices. Practices in early literacy still very much depend on repetition and practice. Kinesthetic experiences in early literacy remain critical. Handwriting remains a central process in human literacy[8, 9]. Handwriting is more important to writing fluency than spelling and serves as a critical experience in learning how to read[8]. Furthermore, good handwriting continues to be necessary for in-person exams, as good handwriting is correlated with academic achievement[10]. Interestingly, one of the first reactions to the inception of large language model generative AI has been the return to handwritten exams. As universities grapple with verifying academic achievement and avoiding academic dishonesty, the movement to handwritten exams is already happening[11].

Social changes to communication styles dictate that literacy be attended to multi-modally. This becomes problematic when considering adult digital literacy. Teachers' overall comfort with technology influences their likelihood of implementing new technologies[12]. Resistance to new technology is not merely based on perceived agency within teachers, but is also attributable to issues around lacking agency, parental intrusion, and amplified fears of lacking social justice[13, 14]. Furthermore, new practitioners explicitly instructed on educational technology during their preservice instruction are more likely to implement new technologies[15, 16], which makes this type of training imperative for pre-service teachers.

As digital literacy becomes a pivotal aspect of modern education, the advent of large language model Artificial Intelligence (AI) offers new dimensions for enhancing language learning and writing instruction. AI has historically proven to be a useful tool in scaffolding second language learning and bilingualism[17] with AI helping students with low competence feel more autonomous[18]. Furthermore, AI can insert gamification into language learning[73]. In the primary language, engagement with AI can also help to make writing a more fun and interactive process[19]. This type of just-in-time support can lead to students feeling appreciation for the AI suggestion, with many reporting an increased awareness

of metacognitive strategies when writing[74].

AI research has seen significant growth over the past 23 years[20, 21, 22, 23]. Literature reviews on the topic indicate a burgeoning interest in AI within educational settings, encompassing both language acquisition and composition[21, 23]. The United States is currently peerless in leading the research charge, with Arizona State University publishing the bulk of the research on this topic[21, 23]. Globally, the United States is also poised to serve as the world leader in research and application of early deployment and access to generative AI[24]. As such, research continues to move from purely academic contexts into more practical applications for AI implementation that are appearing in disparate digital spaces[25].

These trends began well before the 2022 introduction to the Large Language Model AI ChatGPT. The introduction of this technology had a direct impact on all levels of education, with some school districts quickly moving to restrict access to the technology only to reverse action due to the futility of restricting student access to the platform outside of brick-and-mortar educational settings[24]. With so many institutions expressing frustration with policies on academic honesty, teaching and learning will not only change because of this technology, but also that the trend of increased AI research will only continue[26]. This technology is proving trying for institutions, with many educational leaders feeling unable to react to the swiftly evolving implementation of AI[26]. While they are slow to draft, many are arguing for the importance of centering people within the AI loop, seeking to avoid algorithmic discrimination, ensure safety, ethics, and effectiveness while promoting transparency[27, 72].

Building on the foundation of traditional literacy practices, the advent of AI introduces new dimensions to traditional educational practices. The digital divide has traditionally been between those with and without digital literacy. The gulf between these two groups is now being exacerbated by those who can leverage Artificial Intelligence and those who cannot[28]. AI has the potential to create per-

sonalized and differentiated learning environments. Alongside this benefit, there is still the potential problem due to both ethical concerns revolving around data privacy as well as the pitfalls of academic dishonesty. Problematically, this AI demonstrates that it can create responses that will pass for those written by humans[29]. Historically, detecting AI-created writing has proven to be a challenge[30]. Consequently, AI cannot take responsibility for its writing and its implications, thus it cannot be deemed an author[31]. Furthermore, unguided AI use can lead to ethical dilemmas, including reinforcing biases, issues with data privacy and surveillance, and reinforcing discriminatory practices[32]. As educators embark on reflecting and developing literacy instruction, there needs to be an appropriate balance between both traditional pedagogical practices and the inclusion of new technologies.

While these mounting concerns remain paramount, significant potential benefits from AI support within the classroom still exist. This model is seen as closing the feedback loop during writing, providing substantial advantages[33]. During the writing process, students can leverage LLM AI to help support generating ideas, confirming structural fluency, and throughout the editing process. Students will “now [have] direct, meaningful, timely, and data-driven conversations with individual learners” [33, p. 124]. Often a singularity solitary process, writing can instead be a dialectical process with AI serving as a conversational partner in the drafting process.

New research will be necessary to contend with the long-term impacts of access to LLM AI, as well as to inform best practices in writing pedagogy. This literature review will look at contemporary practices and research around digital writing instruction. Furthermore, it will contend with contemporary topics of discourse around ChatGPT and will seek to identify gaps in the literature. This review will try to capture the current talking points around large language model AI and where it fits within the writing curriculum.

This review aims to address at the following research problems:

- 1) How has writing pedagogy shifted in response to the advent of digital writing tools?
- 2) What are the pedagogical responses to Artificial Intelligence?

The review process will encompass various aspects of writing instructional practices. Within the context of this literature review, writing instruction will include topics of instruction related to writing practices within both the native and secondary languages of students. This review will focus on writing across the curriculum, offering insights into research from early education through tertiary education.

## 2. Methodology

Within the context of this literature review, writing instruction includes topics related to writing practices in both native and secondary languages of students. Additionally, it covers issues related to digital writing, the evolving definition of academic honesty, and the ethical use of AI. This review focuses on writing across the curriculum, providing insights into research from early education through tertiary education. The selection criteria encompass writing instruction for both native and second language learners, while exclusion criteria eliminate sources that are not in full-text, not peer-reviewed, or not directly related to the key themes of writing instruction and AI integration.

Initially, two researchers divided their attention between K-8, high school, and university settings. The researchers looked at the key terms: “digital writing”, “writing instruction” and “AI”. After an initial query via Google Scholar, Proquest, and Ebsco, the researchers also engaged in minor queries via other smaller databases: JSTOR, One Search, and Science Direct. The researchers added terms such as “generative AI”, “TPACK” and “ChatGPT” in conjunction with “digital writing” and “writing instruction”. The queries were screened by reviewing the titles and abstracts to determine if they fell within the scope of writing instruction.

Articles were reviewed by reading the abstract to ensure that the papers covered the topics of writing

instruction as affected by Artificial Intelligence, many from 2023, with only one from 2013. Articles about subjects outside of language learning, acquisition, and expression were excluded. Initially, 69 articles were identified for this study and then coded to identify overarching themes, to then aggregate significant trends across the research.

For this review's purpose, 15 articles were removed because they focused on the scope of government policies which is outside of the focus of this work. Eight articles were removed because of repeated titles. One article was removed because we were unable to access the source. Finally, one article was removed because it lacked relevance which could only be determined after reading. Finally, one article was removed because it did not discuss Artificial Intelligence. The final count for this literature review is 43 articles.

While reading each article, the researchers took extensive notes on the nature of the research, the context, the results, and the discussion. Notes included the type of study, the number and age of participants, the research questions and design, the results and limitations, as well as any pertinent quotations. Each article was then grouped into the following topics: Digital Writing, ChatGPT, AI before ChatGPT, Bilingualism /language acquisition, AI writing, Teacher Competencies, Pedagogy and Motivation, and finally Academic Honesty. Once grouped, the information was compared across studies using a spreadsheet to identify trends and synthesize the data.

After categorizing each group of articles, the key findings of each project were summarized. Then the spreadsheet was reviewed to see if there were any anomalies or trends among the articles. Themes emerged around leveraging digital spaces to maximize motivation during the writing process, along with early calls for change to traditional writing instruction. Looking over the early research around ChatGPT look at the primary concerns most academic institutions have articulated around academic honesty and the general lack of professional development and support for individual teachers.

Future research will be necessary to gauge how LLMs affect overall writing competencies. As institutions grow more comfortable with generative AI, policies, and practices will continue to evolve. And as access to free AI assistants is proliferating, the changes to communication styles will also need to be researched.

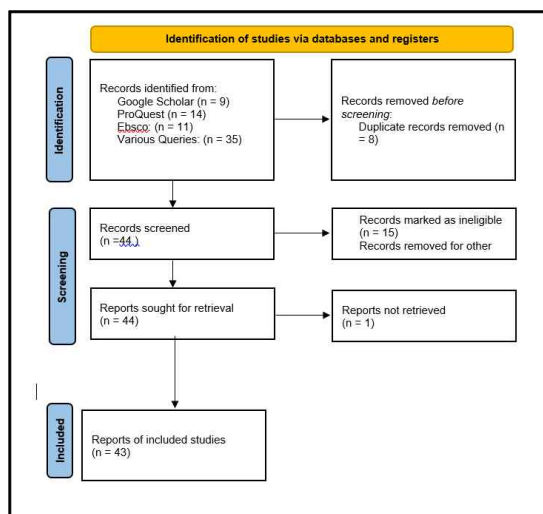


Figure 1. Systematic Review Process

Figure 1 shows the systematic review process, starting with the identification of records from various databases (Google Scholar, ProQuest, Ebsco, and various queries) totaling 69 articles. Duplicate records (8) were removed before screening, resulting in 44 records. After screening, 15 records were marked as ineligible, and additional records were removed for various reasons. Finally, 43 reports were included in the study after seeking retrieval and accounting for non-retrieved reports.

### 3. Results and Implications

#### 3.1 Digital Spaces for Engagement

As communication practices evolve with new technologies, pedagogical practices around writing instruction must also adapt. Digital spaces create unique affordances that can transform student writing engagement, making this topic necessary for fur-

ther investigation. And while these spaces have become more popular in the writing classroom, the initial reaction to LLM AI has been to quickly abandon this space in the name of academic honesty. However, the research within this writing space offers up fecund justification for continuing to leverage this space for writing instruction. Looking over the research on writing instruction within digital spaces, several themes emerge. Digital writing affords student writers access to authentic audiences[2, 34, 35]. Digital spaces facilitate motivation for writing by creating novel communities of practice. The interplay between community and individual student growth in the writing process has been investigated, revealing that focusing on the classroom community as an authentic audience increases student motivation for writing and facilitates engagement with analytical audiences[34]. Writing directly with a real reader in mind made the task more important, thus elevating student engagement and motivation. A similar conclusion was reached when digital spaces were used to create online communities and connections[35]. Their case study reviewed the impact of their workshop: “Gathering Stories: A Digital Storytelling Workshop for Young Women” from July of 2021. Student authors expressed their appreciation for how digital storytelling helps create real-time connections, story creation, contextual and multi-media expression as well as opening accessibility for writers. The ameliorative effect on affective experiences, both during and after the global pandemic, was also expressed. A similar appreciation for promoting authentic writing interactions was found through the Mentored Multigenre Project[2]. The project provides a collaborative and supportive environment in which high school student and teacher candidates can engage in meaningful writing interactions and learn from each other made possible because of the online hosting webpage used to publish student writing and create space for qualitative feedback from preservice writing teachers. “Through the Mentored Multigenre Project, we saw how having a choice of a valued topic, writing for impact, and receiving feedback that centered on expression rather than conventions cre-

ated an authentic writing experience for a high school writer[2, p. 637]. Research is still necessary on the nature of audience demographics to determine if there is a difference between writing for feedback versus writing for within-group communication.

Digital spaces can be more inviting than pen-and-paper writing. Higher quality writing was reported by student writers when engaging online, according to a mixed methods study about student perception. The suggestion was made that digital tools should be used when writing[36]. Digital writing spaces help facilitate asynchronous feedback opportunities, which are linked with promoting positive perceptions about writing. Multi-genre writing was linked with reducing writing apprehension, as digital spaces allow for the manipulation of video and images, helping to inspire the first steps in the drafting process, unlike white page syndrome where students are overwhelmed by the possibilities of the beginning[37]. Furthermore, participants responded that learning how to compose in one mode helped when composing in different modes. Writing is a series of choices. Diversifying the types of choices student writers make will help augment a sense of agency and ownership over the communicated method. Furthermore, image integration can serve as an excellent scaffold for very young writers.

Digital spaces create room for flexible collaboration[2, 35, 38]. The use of Google Docs facilitates online collaboration[35]. Over six weeks, students in the experimental group interacted in Google Docs, a second group interacted via the Learning Management System (LMS), and the third group completed assignments individually. Data was collected from translation tests, engagement questionnaires, semi-structured interviews, and student interaction on online platforms. One-way ANOVA demonstrated statistically significant improvement in overall translation performance and translation subskills of the Google Doc group. These students posted more and shared more than students who engage in discussion forums. Ultimately, students in this condition reported greater appreciation for collaborative engagement and reported the perceived usefulness of Google

Docs. Writing instruction has traditionally been a very lonely process, with the student left alone to grapple with their internal monologue. Digital spaces offer engagement windows for others to be part of the drafting process.

Digital spaces can also help facilitate second language acquisition. An added benefit of using AI-powered digital writing assistants, specifically the AI-powered digital writing assistant Wordtune, is the facilitation of revision and rewriting for English as a foreign language (EFL) writers[39]. This assistant can help to keep EFL writers engaged by helping with difficult words and expressions in English. While this can help maintain engagement, the tool is limited in the types of feedback it gives to complicated writing, with the topmost suggestions for rewriting being more accurate than those that appear later down the list. With this population of writers, closing the feedback loop helps in nurturing autonomous EFL learners[40]. Students reported finding flow experiences in student-centered presentations more so than during teacher-centered lectures. This reinforces the idea that social presence is very central to learning in online spaces. Finally, language proficiency was a significant predictor of semester grades and work quality. This study also determined that when using AI tools, there must be a clear demonstration of how to use the tool before launching it in class[40].

Engagement with automated computer feedback can be leveraged to scaffold better revision in student writing[41]. Focusing on the guided design program Annotator could help guide students by offering up pre-authored labels “featuring key disciplinary ideas to a fictional peer’s explanation, engaging students in distinguishing which scientific idea will fill a gap in the given explanation, and how to modify the initial ideas in the explanation to integrate a new idea” [41, p. 2]. Completing this study with 798 6th and 7th-grade writers, qualitative data demonstrated that the Annotator activities were significantly more helpful after two rounds of engagement. Looking at the data collected from logged revisions and classroom observations reinforces the idea that the Annotator activity helped make the concept of edit-

ing more concrete for students. It remains unclear if student writing improved because of the modeled types of editing, or if it was engagement with the digital look.

And while this type of support can be helpful, that support is limited. Humans serve as better grammar checkers than artificial intelligence[42]. Grammarly sometimes erroneously identifies errors in writing completed by EFLs. It does not do well identifying the lack of auxiliary verbs and is deficient in detecting passive voice and improper pronouns. “On the whole, the AI-based grammar checker provided corrective feedback which was not critical to enhancing the writing quality, and it sometimes showed incorrect suggestions”[42, p.126]. Ultimately, grammar checkers are limited and should be used but not considered as resulting in finalizing perfect writing. There is a great deal of progress that can and should be made to fully develop these trackers. AI can also prove to be a hindrance to language learning. Using cluster analysis to study the interplay between EFL students and AI, four clusters of students were identified: effective learners, passive learners, well-balanced learners, and ineffective learners. Passive learners engaged with AI the least and demonstrated the least academic achievement. Interestingly, ineffective learners showed the greatest engagement with AI but persisted in low academic achievement, suggesting that a necessary strategy beyond interaction alone is required and that the types of engagement with the AI determined overall learning[43]. Passive learners engaged with AI least and demonstrated the least academic achievement. Interestingly, ineffective learners demonstrated the greatest engagement with AI and persisted in low academic achievement, suggesting that there is a necessary strategy beyond interaction alone and that the types of engagement with the AI determined overall learning.

Digital Storytelling seems to positively influence language learning in both adolescents and adults[44]. When looking closer at the 71 journal papers offering up this conclusion, these researchers determined that these studies were insufficient either in little consideration of the factors that could affect the results of

the study or because they did not report on the reliability of the instrument used within the study[44]. Much like his overall critique on research within this field, most of the studies within this literature review involved very small groups of students, making the reproducibility of each study difficult to replicate. Overall research does support that engagement with a chatbot is less stressful than working directly with a human because of the lack of fear of judgment. The research around digital spaces for engagement was balanced across different methodologies and studied populations.

### 3.2 Early Calls for Changes to Writing Pedagogical Practices

Traditional pedagogies around writing instruction need to react to the different mediums of communication ubiquitous in modern society. While the essay is a fine form for examining logic and understanding, standardized practices of assessment do not capture total student comprehension. The need for change in assessing writing was considered as early as 2021, particularly when examining pedagogical practices in Victoria, Australia. A radical change in the types of writing assignments and instruction styles of contemporary classrooms is argued for to address this issue[45]. The writing assessments that are standardized throughout the curriculum are highly structured and easy to reproduce, which is exactly the type of writing the GPT-3 technologies are proficient at creating. McKnight argues that the current form of writing assessment in conjunction with the national curriculum will kill any natural desire to write. They are instead proponents of the idea of *compos (IT)ion*, which is digital creating that blends student writing with digital integration, making the process more inventive and playful. While these recommendations help open the traditional definitions of literacy, prescriptions on how to assess and report student achievement remain lacking. A change in assessment from traditional means to specs grading is similarly argued for[46]. This type of grading helps to support a growth mindset. Students perform as well under

specs grading as under traditional grading systems. “When students trust that their work is meaningful, open to revision, and in service of their learning—when, in short, the grade is not the most important thing—they may be far less likely to circumvent the process by asking a chatbot to do it for them”[46, p.3]. Here the focus becomes the process over the product. While this returns the focus on student learning and evolution, it does not consider the time necessary for educators to assess and reassess work.

In reviewing the 2018 English Language Arts (ELA) policies of the English Language Arts Teacher Educators (ELATE) Commission on Digital Literacies and Teacher Education, similar conclusions were reached. Literacy means literacies, indicating that AI literacy is part of the ELA umbrella[47]. When engaging with AI, students need to balance critical evaluation and revision skills to add “humanity, novelty, and surprise to their texts”[47, p. 203]. As new forms of media are encroaching into communication spaces, ELA teachers need to lead the charge in harnessing this type of writing. These researchers reinforce the idea that this technology is not neutral and that ELA teachers need to discuss bias.

Early research looking at teacher and administrator views on generative AI signals the need to embrace a growth mindset. Early research on teacher and administrator views on generative AI signals the need to embrace a growth mindset. Both survey and focus group research with teachers and administrators revealed four broad themes across participants’ opinions[48]. First, participants reported the need to help scaffold critical thinking and reasoning skills within the context of 21st-century digital literacy instruction across all disciplines. Second, teachers need direct instruction and guidance on how to best implement AI within their disciplines. Third, assessment practices will need to change and grow more reflective and diverse to best qualify student performance on both formative and summative assessments. Finally, both groups reported a largely uninspired view on using AI to complete administrative tasks at this time. These impressions were gathered during the early inception of ChatGPT, which means that the results need to be

understood within the context of Amara's Law. This law about technological innovation is that reactions to new technology tend to attribute an oversized impact in the short term, and an underappreciation of greater implications in the long term. This underscores the need to reevaluate traditional pedagogical frameworks in both the short- and long-term. And throughout this process, training around literacy needs to be ongoing and cross-disciplinary to better empower teachers to responsibly harness AI while balancing concerns such as ethics, equity, and access.

### 3.3 Teacher Competencies in Technology and Writing Instruction

Writing is a form of learning. Being able to articulate content learning in the written form is a process that supports overall fluency with the information. While this type of engagement in school is valorized as qualifying student achievement, teaching teachers concrete writing pedagogy tends to be lacking in pre-service programs. In a study, 900 K-5 teachers were contacted regarding this process and their likelihood of using writing-to-learn activities within the classroom[58]. Of the 150 respondents, 67% reported that they felt that they had little to no preparation on how to use writing to support learning. Furthermore, they “found most elementary teachers who responded to our survey received little formal presentation at the college level on how to use writing to support students’ learning of classroom content or concepts, with 67% reporting minimal to no preparation at the college level” [58, p. 2405]. One limitation of this study is that it is based entirely on self-reported data, which can be misleading. And these opinions were collected before the advent of generative AI. With so many teachers reporting their unease in delivering sound writing pedagogy within their context, the advent of generative AI will likely amplify these feelings of discomfort.

A quantitative survey was used to capture the perspectives of 147 teachers in the USA, UK, and Canada. The survey, hosted on Qualtrics and disseminated via SurveyCircle, demonstrated a largely

positive perspective towards generative AI regardless of their preferred teaching style[59]. Teachers who had engaged in interactions with generative AI correlated with a more positive impression of the technology. Teachers positively perceived the implications of AI in education and see themselves using it both in their professional context as well as with students. “Because users must consider the formulation of their questions to receive the desired guidance, chatbots can be seen as facilitators of self-directed learning” [59, p. 316]. While early polling on teacher perceptions about generative artificial intelligence is most positively felt in the K-12 context[59], not all research presenting early impressions on generative AI is quite so positive. “In addition to being protean, unstable, and opaque, GenAI tools have two other unique characteristics that no technology has ever exhibited before. Gen AI tools are generative and social” [60, p. 241]. Furthermore, AI is unpredictable, and the quality of the output is based on the quality of the input.

By looking at this new technology through the TPACK framework (Technological Pedagogical Content Knowledge), these researchers see that this type of AI will absolutely affect the educational context, though likely in ways that we are not going to expect. They argue that Gen AI will change the face of teaching and learning but will have a far greater impact on the overall culture, like the introduction of movies. Pundits argued that movies would forever change the classroom, but that is not the case and the overall impact of movies on culture is unimaginable. Problematically, AI amplifies issues of academic dishonesty, hallucinations, the poor success rate of AI-generated text detection, amplifying bias, and increasing the digital device. Possible strengths include personalized learning, real-time feedback, improved accessibility, and assistance in the research process by helping to identify appropriate literature as well as summarizing longer articles. “Navigat[ing] the wicked problem of technology integration in teaching” requires a shift in thinking of technology as a tool and instead as a co-creator of meaning[60, p. 242].



Building on the study applying generative AI in teachers' pedagogy[59], a continued focus on Technological Pedagogical Content Knowledge (TPACK) is emphasized. These competencies need to be further elevated to include AI-based tools, specifically focusing on teacher perceptions around pedagogy and the ethical issues of transparency, inclusivity, fairness, and accountability[61]. Furthermore, teachers must understand the decision-making processes associated with machine learning to better comprehend AI decisions. The more teachers understand the ethics of AI use, the more profound their understanding of the pedagogical contributions of AI. In this context, greater Technological Knowledge (TK) allows teachers to better understand AI decisions. Best practices occur when teachers possess both high TK and high Pedagogical Knowledge (PK). Teachers with a comprehensive understanding of AI support within education, particularly in assessment and early warning flag practices, are more likely to effectively use these tools to foster deeper learning.

A similar conclusion was reached that a greater investment in augmenting teachers' TPACK is necessary when engaging with AI, while sharing the overarching positive projection of educational improvement. AI is seen as augmenting the student experience by engaging in intelligent tutoring, individualized learning, and recommendation systems, improving the performance of learning management systems, and helping to customize individual learning journeys[54]. They also identify ways that teachers can improve their overall practice by using AI to facilitate the generation of practice questions, creating just-in-time personalized support, and an overall reduction of administrative tasks. And while these will improve the experiences within the classroom, AI will cause several challenges for online teaching and learning. Many of those issues stem from the lack of funding, access, training, and lack of a general framework or guideline on digital competencies for educators. Ultimately, these researchers argue for the implementation of the DigCompEdu Framework created by the European Commission in 2022 when

looking to fully implement AI within educational contexts. This framework is meant to augment professional development and access, while also looking at reforming assessment, and empowering learners through increased digital competency training. As such, all these quantitative studies relied on self-reporting surveys. This type of limitation precludes teachers with limited TPACK, as they are less likely to engage in the survey model, thus positively skewing the reported data in a favorable light. Furthermore, perceptions about technology are not correlated with direct implementation. Once again, time and resources need to be allocated to professional development with hands-on experience with AI to better implement use within the pedagogical process associated with content-specific writing.

### 3.4 ChatGPT

The introduction of large language model generative Artificial Intelligence had an immediate impact on education. In the spring of 2023, 23% of students were using AI to complete coursework, with that number jumping to 49% by the following fall semester[49]. "ChatGPT has a structured conversation system so that users can ask the AI to write poetry, correct coding errors with detailed examples, write new code, make orders for AI-based artwork, and various other algorithms" [50, p. 54]. While highlighting ChatGPT's flexibility and potential to enhance learning experiences, Fitria also notes the importance of addressing the AI's limitations, including its reliance on the quality of its training data, which opens the broader criticism around the ethical use of AI. The IDEE framework (Identify the desired outcomes; Determine the appropriate level of automation; Ensure ethical considerations; and Evaluate the effectiveness) is used to further the dialogue about ethical engagement with AI[51]. These researchers explore the possible benefits and problems that can result from the introduction of AI in education. There is the potential for more personalized and effective learning in partnership with AI, but many challenges include ethical and safety concerns as well as in-

correct information, and the untested nature of its effectiveness. Another challenge includes the prohibitive cost, as well as the potential harm to existing assessment systems. AI can only draw conclusions based on the accuracy of the data it is trained on, and it is currently overly confident in its conclusions because there is no way to clarify the biases and inaccuracies that exist within the flawed human data input[52]. Institutionally, individual school sites need to determine if the prohibitive cost can be drawn from previous revenue streams that are no longer as pressing.

A similar exploratory review of the possible benefits of ChatGPT in education was completed by examining peer and non-peer-reviewed information[52]. The study found that AI can personalize tutoring, automating the grading of student writing, translating between languages, and creating more interactive and adaptive learning experiences. They also determined that problems could arise from the following issues. Firstly, the lack of human interaction during the learning process could lead to a lack of meaningful guidance. Furthermore, there is a bias within the training data which could amplify current social ills. AI is also unable to understand the context. And finally, there is a lack of privacy. This concern about data privacy needs to remain front of mind as educators begin to think about integrating this technology into the curriculum. The issues around data privacy are only growing as younger children are increasingly becoming targets of hackers[53].

ChatGPT is being touted as a writing partner that can help close the feedback loop necessary during the writing process. Writing has traditionally been difficult to scaffold because of the limitations associated with the number of student writers in each classroom against the time and attention of one teacher. Here, the AI can fill a large attention gap throughout the writing process. Feedback provided by AI was compared against human scorers using the following measures when evaluating student writing[55]: 1. Criteria-based; 2. Clarity of directions on improvement; 3. Accuracy; 4. Focus on necessary

features; 5. Maintaining a supporting tone. Twenty-six classrooms from two schools in Southern California wrote essays based on sources in their history classes. Two hundred essays were randomly sampled, with 50 designated EL, 50 were reclassified fluent English Proficient, and 100 were fluent English speakers. Rating swerve coded and then ran ANOVA for each of the feedback characteristics to determine if there were differences between human and AI feedback against each criterion. Human feedback was better in all criteria except for criteria-based grading. There was no difference in the quality of feedback given to ELLs versus English fluent. The accuracy of AI feedback declined as the quality of the underlying essay rose. AI feedback that prioritized essential features was best for average-scoring essays and worst for high-scoring essays. The AI tone was also not very supportive of low-scoring essays. While not as robust, the feedback from ChatGPT was relatively good without any prior training. That said, it still offers inaccurate advice, which means that both students and teachers need to understand AI feedback to maximize the impact. One limitation of this study is that the feedback source was easily identified as being provided by humans or AI. Working with AI during the writing process can help reduce frustration, and lead to greater growth in writing proficiency. Furthermore, AI support during drafting and editing can reduce teacher workload and amplify students' feelings of independence and agency. That said, the variance in feedback quality suggests that the utility of AI during the writing process is a determinant of individual writer proficiency, which raises important questions about when and how AI writing support can be integrated.

Early research on the use of ChatGPT demonstrates that AI can be a motivating factor for learning English. 80 teachers and students completed an online survey about AI and its perceived uses within the language learning context. "Even though most participants seem to like AI, some are concerned about the future of education, especially teachers and academics" [56, p. 42]. Most participants reported that using ChatGPT would motivate ESL stu-

dents, but they also showed a neutral attitude toward overall language acquisition. Individuals also reported high levels of motivation to learn without an instructor. This study lacked supportive qualitative research to cross-reference findings. Early research on EFL teachers' perceptions about the inclusion of ChatGPT in second-language instruction is captured [57]. Twenty university writing teachers reported that ChatGPT can be useful in creating learning materials. They were less likely to use it to assess student performance but reported a great deal of agreement on the value of helping students with reading materials as well as helping to assist in the completion of writing tasks by offering support for students during the drafting process. Instructors also felt that ChatGPT was useful in improving students' writing abilities, grammar, vocabulary, and willingness to engage in writing assignments. The majority found that ChatGPT was an excellent assistant during the writing process. One limitation of this study is that it was very localized and based on a very small sample size.

### 3.5 Academic Honesty

The introduction of ChatGPT and other large language model (LLM) generative AI is disrupting educational processes. Concerns have arisen about cheating, misinformation, bias, abuse, misuse, privacy, and safety. "On one hand, concerns such as academic integrity; accuracy of information or misinformation; biases, discrimination, and stereotypes; misuse, abuse, and other ethics; and privacy and security are yet to be addressed. On the other hand, ChatGPT offers innovative teaching approaches, new assessments and curriculum, and personalized learning" [62, p. 2]. When ChatGPT was first introduced in November of 2023, academic institutions reacted quickly by rewriting academic honesty policies to preclude AI-written work submitted as student work. Large school systems in Los Angeles and New York blacklisted the technology from their internal servers. While many have reversed these bans, much of the discourse around generative AI remains concerned with both

deep fakes and academic honesty.

Post-secondary educators' attitudes around ChatGPT were researched after a brief interaction with the technology. Instructors reported the need to change their courses and expressed anxiety about their abilities to adapt to the technology, highlighting a need for more training. Approximately 47% felt nervous or anxious about using AI in class [63]. Most instructors reported anxiety around plagiarism and the difficulty in evaluating student writing, with many concerned about fostering academic accountability within their students. "In the quantitative survey items, roughly 73 percent believe that AI-assisted writing will lead to lower perceived authenticity. About 62 percent believe it will lead to lower perceived credibility of communicators" [63, p. 269]. Ultimately, the argument is made that students should perceive themselves as the managers of AI. A call to action for more professional training for educators is reiterated, emphasizing the development of AI literacy. Teaching and learning should move towards higher-order learning with robust class discussions and more experiential project-based learning. Community is essential in the AI age, and institutions need to set a clear community-based vision with accompanying policy.

While detecting student writing is a concern in tertiary teaching contexts, this issue is of greater concern for professors who speak English as a second language. A small cohort of ESL lecturers in Cyprus was studied to determine how well they could detect AI writing. This study unfolded in three stages [64]. First, four essays were created with varying degrees of AI influence: one fully composed by AI, one written by AI from a human-created outline, one which was evenly mixed with human and AI writing, and the final essay was fully composed by a human. During the second round of this study, the researchers used AI detectors, turnitin.com, OpenAI Detector, GPTZero, and Crossplag to detect AI writing. These tools were able to detect AI writing in the first essay and determined that the fourth essay was fully written by a human, but their AI detection in essays two and three was not very accurate. The final stage of

this project was to have the ESL lecturers look at the four essays to detect human and AI writing. The human participants were much less accurate in identifying AI-generated text. The lecturers' reasons for determining if it was AI or human-generated were based on false logic, which led to improper detection. This means that there needs to be more professional development on AI in general, as well as student writing practices. Ultimately, there is no fully reliable method to establish human or AI writing. These findings reify the importance of continued professional development and support for educators. The difficulties experienced by these lecturers highlight the urgent need for greater professional development opportunities. This is not just a technological problem, but rather a pedagogical problem in that teachers and students need to rethink how they critique information in an era where AI is so readily able to create data. Future research needs to investigate practical strategies to improve digital literacy among all stakeholders.

While academic honesty is a primary concern, entering an arms race against plagiarism is argued to be misguided. "Much of the discourse centered on plagiarism and academic integrity positions student writers as purposely deceitful and mercilessly unethical" [65, p. 172]. Further, even though this technology is new, we are not without "Decades of scholarship and pedagogy in computers and writing, digital rhetoric, technical communications, and our allied fields" [65, p. 169]. Use of this technology must be explicitly instructed, and students need to be shown how to remain critical of information gathered by AI.

The inability to detect non-human-created media is not limited to adults. A significant amount of deep fake and AI-generated media on social media also exposes children, increasing the need to provide them with digital and AI literacy. The ethical and societal implications of AI-generated media were investigated as perceived by 38 middle schoolers. Participants engaged in a Zoom-run summer workshop on digital literacy and social media[66]. Students were introduced to socio-technical systems of algo-

rithms, information media, and social media. They were also introduced to generative modeling techniques which included Deepfakes. Finally, students were instructed on how information, including false information, is spread via social networks. After completing this workshop, students engaged in a survey that assessed their ability to identify AI-generated media as well as capture their personal feelings about their general attitudes toward AI and generative machine learning. Students scored very similarly on the pre- and post-testing about identifying deepfakes, which suggests that the workshop did little to help students ultimately identify AI-generated media. However, students were much more engaged in the activity during the post-test and expressed critical attitudes about information consumed online and via social media. Further, the workshop closed with students advocating for real policy implementation to better fight against misinformation. Once again, the limitation of this current research is that the technology is so new that the sample sizes of each project were very small.

### 3.6 Writing with AI

The introduction of ChatGPT has elicited reactions ranging from dazzling magic to apocalyptic worry. "Disarming and delighting users, ChatGPT can appear to know everything and nothing in the same sentence" [67, p. 43]. Early engagement with ChatGPT has led to similar conclusions about the need to keep humans at the center of the process. While this can be exciting, users must remain critically evaluative of any material created by AI. Furthermore, responsibility for ensuring equity and ethical use of AI falls on humans. "Two primary functions of human writing remain important no matter how advanced AI technology becomes: the personal human growth that occurs during the writing process and the extent to which the product of composition furthers human-to-human communication" [68, p. 32]. AI can serve as a co-author but cannot create virtuous writing because machines are incapable of including character, intellect, or care.

Virtue is built into writing by the fact that the author must have some compassion for his audience to craft meaning that can be consumed by someone else. To grow as a writer, you must develop your own voice, autonomy, confidence, and positioning. These authors see multimodal writing as the future. Print is no longer the dominant communication platform, so writers are now more designers of information to maximize the impact on their audience. This type of writing still requires human-to-human contact, as this process includes a designer and an intended audience.

“Multimodal composing asks writers to stretch their thinking, to consider what besides words can help them tell their story” [68, p. 36]. To write virtuously in the age of AI, one must be discerning about its output, and critical about the possible amplification of discrimination and bias embedded in the output.

The opinions shared by Dr. Kyle Jensen on the writing process were summarized. Dr. Jensen serves as a Professor in the Writing, Rhetoric, and Literacies program in the Department of English at Arizona State University and as the Director of ASU Writing Programs[69]. As such, he defines writing as “a social phenomenon that evolves and expands over time with the introduction of new technologies. It also teaches us to watch writers engage complex problems so that we, in turn, may do the same” [69, p. 768]. They further argue that it is better to look at human writers to better understand the writing process because AI is a black box of composition. It is a parlor trick that keeps the process hidden. Writing should be viewed as a series of discrete decisions made by a human. Dr. Jensen models using AI as a writing assistant for use during the reigning processes associated with writing. That said, the human writer is still critical in making the decisions about what to keep and what to amend based on AI suggestions. One practice he advocates involves students creating a sentence or a paragraph and then asking AI to rewrite it 10–15 ways. Students then choose which is best, thus centering them as decision-makers in the creation of meaning. “In this context, Dr. Jensen discussed moving away from deficit-based approaches to writing instruction and the

importance of providing students with high-quality resources that encourage them to experiment with AI tools in affirming spaces that support identity expression and development” [69, p. 770].

When investigating the opportunities and challenges with writing instruction and assessment, AI is seen as a possible support for students learning a second language. Additionally, the argument is made that the student remains centered within the process and that ultimately, only humans can process information, which AI is incapable of doing[70]. Teachers need to design good writing projects that cannot be completed by AI. Moreover, longer writing assignments need to be scaffolded into multiple drafts that are accompanied by reflective writing to demonstrate learning. They also argue that AI cannot be a co-writer because ultimately the conclusions made by a writer must be made by that writer, and AI cannot be held accountable for any contents of the writing.

AI can help support developing writers, particularly those learning to write in a second language. AI can be leveraged to assist with brainstorming or creating an experimental design, and as the writing process progresses, it can also help with editing and revisions. When correctly leveraged, this type of support can amplify writing learning by addressing the justifications for certain suggestions on clarity, coherence, and organization. AI should be leveraged similarly to the framework used for second language acquisition: it should provide information just beyond one’s current level of competency, help learners focus on language features they are mastering, support social learning with more fluent speakers, and facilitate meaningful interaction, which leads to language acquisition. These same practices can be applied when using AI during the writing process[71].

Great potential is also seen for including ChatGPT in the argumentative writing classroom. High-quality writing is defined as including a valid claim, relevant, adequate, and credible evidence, appropriate reasoning, and effective rebuttal[51]. They argue that effective feedback is critical during the writing process and that using an AI chatbot while writing as a thought partner will help build up L1 and L2 student

writers. ChatGPT can evaluate different stages of writing. It can help with conceptual planning by acting as a tutor during the writing process. By feeding the AI differentiated writing rubrics, the tutor can better tailor to different levels of language learning. ChatGPT can also be used to help craft examples. Students can also return to earlier chat history to help scaffold both metacognition and memory.

#### 4. Conclusion

The evolution of pedagogy around writing instruction is inevitable in the face of burgeoning technologies. Just as math instruction changed after the advent of the inexpensive pocket calculator, writing instruction must also adapt. Communication has transitioned into a post-print era, but the foundational thinking about the dialectic of writing must continue. Writing is inherently a conversation where the writer must consider both their worldview and that of their intended audience. Talented writers understand how to leverage this conversation between self and audience. Writing should be framed as executing a series of decisions and choices about meaning while envisioning the thoughts and reactions of an imagined audience. These choices need support in both online and offline spaces. Writing pedagogy should continue to take advantage of digital spaces, multi-modal writing, and assistive AI.

Critical thinking remains foundational to modern classrooms. Students must be aided in becoming critical consumers of information, and teachers must also be supported in gaining digital competencies. Equitable access to digital tools is essential to prevent the digital divide from growing even larger. Teachers need concrete advice on how best to leverage AI as a thinking and working assistant. Additionally, teachers need support to disincentivize AI plagiarism, and students need to formulate and reinforce positive digital habits that support academic honesty.

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